WHAT IS CLAIMED IS:

1. A computer-based method for detecting one or more edges in a multiple pixel digital image comprising the steps of:

providing a multiple pixel digital gray scale image to be analyzed in an operating memory of a computer;

analyzing said image for edges with an image edge detection application, said application carrying out the steps of:

1) selecting a pixel in said image to be analyzed;

2) identifying an edge path which passes through said selected pixel;

3) calculating an average pixel intensity gradient value for said edge path by comparing a gray level intensity of pixels on one side of said edge path to a gray level intensity of pixels on an opposite side of said edge;

4) using said average pixel intensity gradient value as an input to a fuzzy membership function and generating with said function, a plurality of output values that are related to a degree to which said pixel represents an edge in said image;

5) combining said plurality of output values using a weighted averaging analysis to assign a crisp edginess value to said pixel; and,

6) repeating steps (1)-(5) for additional pixels in said image.

2. The computer-based method of claim 1, wherein said steps of identifying an edge path, calculating an average pixel intensity gradient value and using said average pixel intensity gradient value as input to said fuzzy membership function comprise:

identifying a plurality of different edge paths which pass through said pixel;

calculating an average pixel intensity gradient value for each of said edge paths; and,

selecting the greatest average pixel intensity gradient as input to said fuzzy membership function.

3. The computer-based method of claim 2, wherein four edge paths are identified that pass through said pixel.

4. The computer-based method of claim 1, wherein said average pixel intensity gradient value is calculated by:

selecting an n x n pixel window, where n is an odd number greater than or equal to 3 and said pixel to be analyzed is located at a center of said window;

calculating a first, average pixel intensity value of pixels in said window on a first side of said edge path;

calculating a second, average pixel intensity value of pixels in said window on a second, opposite side of said edge path; and,

calculating a difference between said first and second values to obtain said average pixel intensity gradient value.

5. The computer-based method of claim 1, wherein said step of generating a plurality of output values with said membership function comprises:

employing an input membership function to generate a plurality of input values relating said average pixel intensity gradient value to a plurality of degrees of intensity;

applying a plurality of inference rules in an output membership function that relate the plurality of intensity degrees to a corresponding plurality of edginess degrees and thereby generate said plurality of output values.

6. The computer-based method of claim 5, wherein 3 each of said input values, inference rules and output values are employed; said input values being small, medium and large; said output values being no edge, mild edge and edge; and said inference rules being if the average pixel intensity gradient value is small, the pixel is no edge; if the average pixel intensity gradient value is medium, the pixel is a mild edge; and, if the average pixel intensity gradient value is large, the pixel is an edge.

7. The method of claim 1, wherein said weighted averaging analysis is selected from the group consisting of an averaging union of truncated output singletons or a centroid averaging analysis.

8. A computer-based method for detecting one or more edges in a multiple pixel digital image comprising the steps of:

providing a multiple pixel digital gray scale image to be analyzed in an operating memory of a computer;

analyzing said image for edges with an image edge detection application, said application carrying out the steps of:

1) selecting a pixel in said image to be analyzed;

2) selecting an n x n pixel window, where n is an odd number greater than or equal to 3 and said window includes a center pixel, wherein said center pixel is said pixel to be analyzed;

3) identifying a plurality of edge paths that run through said center pixel and divide said window into first and second groups of pixels;

4) for each of said edge paths, calculating a first, average pixel intensity value of pixels in said first group and a second, average pixel intensity value of pixels in said second group; and, calculating a difference between said first and second values to obtain an average pixel intensity gradient value for each said edge path;

5) selecting the greatest of said average pixel intensity gradient values as an input to an input fuzzy membership function to generate a plurality of input values relating said average pixel intensity gradient value to a plurality of degrees of intensity;

6) applying a plurality of inference rules in an output membership function that relate the plurality of intensity degrees to a corresponding plurality of edginess degrees and generate a plurality of output values that are related to a degree to which said center pixel represents an edge in said image;

7) combining said plurality of output values using a weighted averaging analysis to assign a crisp edginess value to said center pixel; and,

8) repeating steps (1)-(7) for additional pixels in said image.

9. The computer-based method of claim 8, wherein four edge paths are identified that pass through said pixel.

10. The computer-based method of claim 8, wherein 3 each of said input values, inference rules and output values are employed, said input values being small, medium and large; said output values being no edge, mild edge and edge and said inference rules being if the average pixel intensity gradient value is small, the pixel is no edge; if the average pixel intensity gradient is medium, the pixel is a mild edge; and, if the average pixel intensity gradient value is large, the pixel is an edge.

11. The method of claim 8, wherein said weighted averaging analysis is selected from the group consisting of an averaging union of truncated output singletons or a centroid averaging analysis.

12. A computer system for detecting one or more edges in a multiple pixel digital image comprising:

a processor;

an operating memory interfaced to said processor;

a source of multiple pixel digital gray scale images to be analyzed for edges; and

an image edge detection application resident in said operating memory, said image edge detection application carrying out the steps of:

1) retrieving an image to be analyzed from said source of images;

2) selecting a pixel in said image to be analyzed;

3) identifying an edge path which passes through said selected pixel;

4) calculating an average pixel intensity gradient value for said edge path by comparing a gray level intensity of pixels on one side of said edge path to a gray level intensity of pixels on an opposite side of said edge;

5) using said average pixel intensity gradient value as an input to a fuzzy membership function and generating with said function, a plurality of output values that are related to a degree to which said pixel represents an edge in said image;

6) combining said plurality of output values using a weighted averaging analysis to assign a crisp edginess value to said pixel; and,

7) repeating steps (2)-(6) for additional pixels in said image.

13. The computer system of claim 11, wherein said steps of identifying an edge path, calculating an average pixel intensity gradient value and using said average pixel intensity gradient value as input to said fuzzy membership function are carried out by said application by:

identifying a plurality of different edge paths which pass through said pixel;

calculating an average pixel intensity gradient value for each of said edge paths; and,

selecting the greatest average pixel intensity gradient as input to said fuzzy membership function.

14. The computer system of claim 13, wherein said application identifies four edge paths that pass through said pixel.

15. The computer system of claim 12, wherein said application calculates said average pixel intensity gradient value:

selecting an n x n pixel window, where n is an odd number greater than or equal to 3 and said pixel to be analyzed is located at a center of said window;

calculating a first, average pixel intensity value of pixels in said window on a first side of said edge path;

calculating a second, average pixel intensity value of pixels in said window on a second, opposite side of said edge path; and,

calculating a difference between said first and second values to obtain said average pixel intensity gradient value.

16. The computer system of claim 12, wherein said application carries out said step of generating a plurality of output values with said membership function by:

employing an input membership function to generate a plurality of input values relating said average pixel intensity gradient value to a plurality of degrees of intensity;

applying a plurality of inference rules in an output membership function that relate the plurality of intensity degrees to a corresponding plurality of edginess degrees and thereby generate said plurality of output values.

17. The computer system of claim 16, wherein said application employs 3 each of said input values, inference rules and output values; said input values being small, medium and large; said output values being no edge, mild edge and edge; and said inference rules being if the average pixel intensity gradient value is small, the pixel is no

edge; if the average pixel intensity gradient value is medium, the pixel is a mild edge; and, if the average pixel intensity gradient value is large, the pixel is an edge.

18. The computer system of claim 12, wherein said weighted averaging analysis is selected from the group consisting of an averaging union of truncated output singletons or a centroid averaging analysis.

19. A computer system for detecting one or more edges in a multiple pixel digital image comprising:

a processor;

an operating memory interfaced to said processor;

a source of multiple pixel digital gray scale images to be analyzed for edges; and

an image edge detection application resident in said operating memory, said image edge detection application carrying out the steps of:

1) retrieving an image to be analyzed from said source of images;

2) selecting a pixel in said image to be analyzed;

3) selecting an n x n pixel window, where n is an odd number greater than or equal to 3 and said window includes a center pixel, wherein said center pixel is said pixel to be analyzed;

4) identifying a plurality of edge paths that run through said center pixel and divide said window into first and second groups of pixels;

5) for each of said edge paths, calculating a first, average pixel intensity value of pixels in said first group and a second, average pixel intensity value of pixels in said

second group; and, calculating a difference between said first and second values to obtain an average pixel intensity gradient value for each said edge path;

6) selecting the greatest of said average pixel intensity gradient values as an input to an input fuzzy membership function to generate a plurality of input values relating said average pixel intensity gradient value to a plurality of degrees of intensity;

7) applying a plurality of inference rules in an output membership function that relate the plurality of intensity degrees to a corresponding plurality of edginess degrees and generate a plurality of output values that are related to a degree to which said center pixel represents an edge in said image;

8) combining said plurality of output values using a weighted averaging analysis to assign a crisp edginess value to said center pixel; and,

9) repeating steps (2)-(8) for additional pixels in said image.

20. The computer system of claim 19, wherein said application identifies four edge paths that pass through said pixel.

21. The computer system of claim 19, wherein said application employs 3 each of said input values, inference rules and output values; said input values being small, medium and large; said output values being no edge, mild edge and edge and said inference rules being if the average pixel intensity gradient value is small, the pixel is no edge; if the average pixel intensity gradient value is medium, the pixel is a mild edge; and, if the average pixel intensity gradient value is large, the pixel is an edge.

22. The computer system of claim 19, wherein said weighted averaging analysis is selected from the group consisting of an averaging union of truncated output singletons or a centroid averaging analysis.